SCIENCE

VOL. 94 FRIDAY, NOVEMBER 28, 1941 No. 2448

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington, D. C.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

PRELIMINARY ANNOUNCEMENT OF THE DALLAS MEETING

Edited by Dr. F. R. MOULTON

PERMANENT SECRETARY

FROM next December 29 to January 3, inclusive, the association will hold its one hundred tenth meeting in Dallas, Texas. The Southwestern Division of the association and the Texas Academy of Science are joining with the association to make the meeting a notable scientific event in the Southwest. Fourteen of the fifteen sections of the association and two subsections will present a program, a number of which will be comprehensive symposia on subjects of current scientific importance. At these sessions the chairman of the respective sections will deliver their addresses as retiring vice-presidents of the association. In addition, thirty affiliated and associated societies and several local Texas societies, besides numerous educational institutions, are joining in the numerous programs that have been organized.

Perhaps the prospects for the meeting in Dallas can be made clear most easily by comparing a few statistics pertaining to it with those of other meetings held in southern cities. Five previous annual meetings have been held in the South: New Orleans, 1905–06; Atlanta, 1913–14; Nashville, 1927; New Orleans, 1931–32; Richmond, 1938–39. In the following table the number of papers that will be presented at Dallas is

an estimate subject to corrections. The data for the membership of the association are as of September 30 of the respective years. The fiscal year of the association ends on September 30.

Year	Meeting Place	Papers Read	Membership
1905	New Orleans	211	4,321
1913	Atlanta	443	8,350
1927	Nashville	1,141	14,862
1931	New Orleans	1,263	19,889
1938	Richmond	1,706	19,059
1941	Dallas	1,500	21,798

It will be noted that the membership of the association decreased by more than 800 during the depression and recession years from 1931 to 1938, but that there has been a substantial increase since that time in spite of the new world war. Although the national defense effort in this country increases daily the disturbance to its normal life and adds to its tax burdens, more than one thousand new members were added to the rolls of the association during the past October, many of whom are distinguished leaders of American science, education and industry. This remarkable increase in membership is an expression of the fact that we owe to science and its applications the amazing physical and cultural advantages of our day, and of the firm conviction that science is by far the most important guarantor of our future.

At present scientists by thousands from hundreds of our educational institutions and industrial laboratories are making contributions to the national defense that admittedly are unparalleled in efficiency and importance. These voluntary contributions are nearly always made at the cost of much personal inconvenience and often with financial loss not only to the scientists but to the institutions with which they are associated. This fine feeling of responsibility to our country and to civilization will often find expression during the meeting at Dallas. In the almost equally dangerous days that will follow immediately after the close of the war, scientists, accustomed to the long view, will be a great stabilizing force until society rides on an even keel again. Since the varied interests of the association extend into nearly every worthy field of human aspirations and endeavor, it has great advantages over every other organization in serving as an integrating agency of scientific forces for effective combined action. The many thousands of members of the association should begin preparations now for making their joint influence an important steadying factor after the close of the war.

Registration

Registration headquarters will be on the mezzanine floor of the Baker Hotel. This hotel and the Hotel Adolphus are both serving as general headquarters for the meeting and are within five blocks of the buildings where two thirds of the general and scientific sessions of the meeting will be held. The Jefferson Hotel is about eight blocks from registration headquarters and Southern Methodist University is about four and one-half miles distant. A visible directory of all registered persons and their Dallas addresses will be available throughout the meeting at the Baker Hotel.

Each person registering will receive a General Program of the meeting, a book of about 300 pages, which will contain complete information concerning hotel headquarters for all sections and societies, a schedule of dinners and luncheons, announcements of social features, a brief description of the science exhibition, complete scientific programs of all sections and societies, a summary of events scheduled by days, and an index of all persons appearing on the programs. Each person registering will receive also a badge and an identification card which may be required for admission to certain functions. The registration fee is one dollar.

Hotels and Headquarters

General Headquarters: Hotel Adolphus and Hotel Baker.

Headquarters of the Sections of the Association and of the societies meeting with the Association in Dallas are as follows, the rates quoted being for rooms with bath:

Adolphus, Commerce, Akard and Main Sts.: All sections of the Association, American Society of Zoologists, American Society of Parasitologists, American Phytopathological Society, Mycological Society of America, American Society of Naturalists, Genetics Society of America, American Microscopical Society, Society of the Sigma Xi, American Science Teachers Association, Gamma Alpha Graduate Scientific Fraternity, Beta Beta Beta, Honorary Biological Fraternity, American Association of Scientific Workers, the National Social Science Honor Society, Pi Gamma Mu, Inc., Metric Association. Rates: single, $2.50–$5; double, $4–$7.

Baker, Commerce and Akard Sts.: American Association of Physics Teachers, American Meteorological Society, Botanical Society of America, American Society of Plant Physiologists, Sullivant Moss Society, American Fern Society, American Society of Plant Taxonomists, Phi Sigma Society, Potato Association of America, United Chapters of Phi Beta Kappa, Honor Society of Phi Kappa Phi, Sigma Delta Epsilon, Graduate Women's Scientific Fraternity, Texas Academy of Science. Rates: single, $2.50–$5; double, $4–$7.

Jefferson, Wood, Jefferson and Houston Sts.: Limnological Society of America, Ecological Society of America, National Association of Biology Teachers, American Nature Study Society. Rates: single, $1.50–$4; double, $2.50–$6.

Southern Methodist University Dormitories: American Society for Horticultural Science.

OTHER HOTELS IN DALLAS

Ambassador, 1312 S. Arvay St. Rates: single, $3–$5; double, $3.50–$6.

Bluebonnet, 1302 Commerce St. Rates: single, $1.50–$3.50; double, $2.50–$5.

Campbell, Elm and Harwood Sts. Rates: single, $1–$2; double, $1.50–$3.

Cliff, 204 E. Jefferson Ave. Rates: single, $1–$1.50; double, $1.25–$2.50.

Dallas Athletic Club, Athletic Club Building. Rates: single, $2.50–$5.

Maurice, 909 Main St. Rates: single, $1–$1.50; double, $1.50–$2.

Mayfair, 723 N. St. Paul St. Rates: single, $1.50–$2.50; double, $2.50–$4.

Melrose, 3015 Oak Lawn Ave. Rates: single, $3–$4; double, $5–$7.

Sanger Apartments, Ervay and Canton Sts. Rates: single, $2–$5; double, $3–$7.

Savoy, 1908 Commerce St. Rates: single $1–$1.50; double, $1.50–$2.

Scott, Houston and Jackson Sts. Rates: single, $2–$5; double, $3–$3.50.

Southland, Main, Murphy and Commerce Sts. Rates: single, $1.50–$3; double, $3–$5.

Texas, Jackson and Houston Sts. Rates: single, $1.50–$2.50; double, $2.50–$4.

Whitmore, Commerce and Martin Sts. Rates: single, $2–$5; double, $3.50–$10.

White-Plaza, Main and Harwood Sts. Rates: single, $2–$3; double, $2.50–$6.

TRANSPORTATION

Although Dallas is considered by many persons to be located in a remote section of the United States, it is only about 1,900 miles from New York City and 1,050 miles from Chicago, and may be reached by trains, planes and buses. The regular round-trip railway and airplane fares to Dallas from representative cities are as follows:

	Railroad fare	Pullman (lower)	Airplane fare
Chicago	$42.95	$14.70	$ 84.32
Cleveland	58.40	18.90	115.92
Denver	36.50	12.60	84.14
Detroit	56.20	17.90	108.18
Kansas City	22.30	9.00	49.50
Minneapolis	44.35	16.80	111.82
New Orleans	23.43	9.00	53.30
New York	74.00	24.70	148.68
Philadelphia	68.75	23.70	140.94
St. Louis	30.05	11.60	61.02
Washington	67.85	21.60	126.80

All fares are subject to the 5 per cent. Federal tax.

The railroads will arrange for through cars to Dallas from Chicago, Washington and New York, provided a sufficient number of passengers warrant such an arrangement. Other passengers will change trains in St. Louis.

EXCURSION TO MEXICO CITY

Those attending the Dallas meeting who are interested in a tour to Mexico City may arrange such an excursion with the Missouri-Kansas-Texas Railroad Company. The tour will occupy thirteen days of travel and sightseeing, the first stop being at San Antonio, Texas. Nine of the remaining days will be devoted to sightseeing and automobile trips in and around Mexico City. There is much of scenic and historic interest in the tour as it is outlined and it offers a splendid opportunity for a brief vacation following the meeting. The cost for one person for all expenses, including railroad fare and Pullman (lower berth), but exclusive of personal items, such as gratuities, wines, mineral water, etc., is $181.18 from Dallas and return. Or arrangements can be made for the round-trip from the home city with stop-over at Dallas at a saving in fare of about $3. Full details can be obtained by writing to the office of the railroad at 9 Rockefeller Plaza, New York, N. Y.

OFFICIAL MEETINGS

The Executive Committee of the Council will meet at 4:00 P.M. on Sunday, December 28, in the Permanent Secretary's rooms in the Hotel Adolphus, and thereafter as it shall determine.

The Council of the Association will meet at 2:15 P.M. on Monday, December 29, in Parlor E of the Hotel Adolphus, and thereafter as it shall determine.

The Academy Conference will be held on Monday, December 29, in Parlor E of the Hotel Adolphus at 3:30 P.M., or immediately after the adjournment of the council. The conference will be followed by a complimentary dinner to one representative of each affiliated academy and to designated representatives of the association. The dinner will begin at 6:30 P.M.

The Secretaries Conference will begin with a dinner at 6:30 P.M. on Wednesday, December 31, and will be followed by the discussion program.

ANNUAL SCIENCE EXHIBITION

The annual science exhibition will be held in the Baker Hotel from 9 A.M. on Monday, December 29, to 6 P.M. on Thursday, January 1. In general, the exhibition will be open at 9 A.M. until 6 P.M., but on Tuesday it will be open until 8 P.M.

GENERAL SESSIONS

On Monday, December 29, at 8:15 P.M., Dr. Albert F. Blakeslee, director of the Station for Experimental Evolution of the Carnegie Institution of Washington, will deliver his address as retiring president

of the American Association for the Advancement of Science on "Individuality and Science." This session will be held in the Auditorium of the First Baptist Church.

On Tuesday, December 30, at 8:15 P.M., Dr. Edwin P. Hubble, astronomer of the Mount Wilson Observatory of the Carnegie Institution, will deliver the twentieth annual lecture under the joint auspices of Sigma Xi and the association. The title of Dr. Hubble's address is "The Expanding Universe Theory." This session will be held in McFarlin Auditorium on the campus of Southern Methodist University.

On Wednesday, December 31, at 5 P.M., Dr. Rufus B. von KleinSmid, president of the University of Southern California, will deliver the third annual Phi Kappa Phi lecture.

On Wednesday, December 31, at 8:15 P.M., Dean Christian Gauss, of Princeton University, will deliver the seventh annual Phi Beta Kappa lecture in McFarlin Auditorium, Southern Methodist University, on "Can We Educate for Democracy?"

Entertainment, Luncheons and Dinners

The Local Committee will hold a reception for the officers and members of the association and their guests in the Ball Room of the Hotel Adolphus immediately following the address of Dr. Albert F. Blakeslee on Monday evening, December 29.

The American Society of Naturalists, in cooperation with other biological societies and with the association, will hold the Annual Biologists' Smoker at 9:30 P.M. on Tuesday, December 30.

The American Association of Physics Teachers will hold a luncheon on Tuesday, December 30.

Section on Chemistry will hold a dinner on Monday, December 29.

The American Society of Zoologists will hold a dinner on Tuesday, December 30.

The American Society of Parasitologists will hold a luncheon on Tuesday, December 30.

The Botanical Society of America will hold a dinner on Tuesday, December 30.

The American Phytopathological Society will hold a dinner on Tuesday, December 30.

The American Society of Plant Physiologists will hold a dinner on Monday, December 29.

The American Society of Plant Taxonomists will hold a dinner on Monday, December 29.

The Department of Botany of the University of Chicago will hold a luncheon on Wednesday, December 31.

The Genetics Society of America will hold a luncheon on Tuesday, December 30.

The Executive Committee of the American Microscopical Society will hold a luncheon on Monday, December 29.

Beta Beta Beta will hold a luncheon on Wednesday, December 31.

Pi Gamma Mu will hold a luncheon on Wednesday, December 31.

The Metric Association will hold a dinner on Tuesday, December 30.

The American Society for Horticultural Science will hold a dinner on Tuesday, December 30.

The American Science Teachers Association will hold a luncheon on Tuesday, December 30.

The American Nature Study Society will hold a breakfast on Wednesday, December 31.

Phi Kappa Phi will hold a breakfast on Tuesday, December 30.

Gamma Alpha will hold a luncheon on Tuesday, December 30.

Sigma Delta Epsilon will hold a luncheon on Tuesday, December 30, and a breakfast on Wednesday, December 31.

(To be concluded)

SOCIAL IMPLICATIONS OF VITAMINS[1]
II

By Dr. ROBERT R. WILLIAMS
CHEMICAL DIRECTOR, THE BELL TELEPHONE LABORATORIES

But what useful lessons can humanity *en masse* draw from contemplation of this perspective of the ages? What guidance does it give him for the conduct of his racial affairs? May I suggest two points: first, that knowledge brings his significant individual physical environment immeasurably more within his command than a generation ago; second, that his inner nature remains a heritage of a very hoary antiquity which still changes only as the hills change by the slow processes of weathering. With the first, he can adventure with a hopeful intelligence; but the second he must conserve at the peril of extinction.

That man is bringing his external environment increasingly under his control can well be observed throughout the course of history. Cultivated herds and crops, houses, tools, stores of metals, coal and oil, mechanical and electrical power have made his life increasingly secure and leisureful. Almost within our

[1] Lecture given on the occasion of the fiftieth anniversary celebration of the University of Chicago, September 22, 1941.

own memories he has learned of his microbe enemies and has added measurably to his span of life by controlling them. Latest of his discoveries is that his food, which he has continued to choose as the ancients chose it, by its reaction on his palate, contains scores of factors which contribute in unseen but profound and specific ways to his interior environment.

Until about the beginning of this century, there were no generally accepted standards of food requirements. Each judged for himself by his sense of fullness under his belt. When he judged for others, he did so with envy of the luxurious rich or with complacent contempt for the unenterprising poor, according to his own station in society. Women were long recognized by male physicians as being prevailingly anemic. This was thought an appropriate attribute of the weaker vessel till McCance found as late as 1936 that men and women attain the same level of hemoglobin if both receive an abundance of iron. Till recently, food needs were largely a matter of personal prejudice, a characteristic that even nutritionists perhaps have not yet wholly outgrown.

Only within the past decade has the conviction become general that we must do something systematic about our food supply. There were prophets a generation ago who pointed out that the incomes of the poorer half of society were insufficient to provide adequate diets, but their voices carried little weight as their standards of adequacy were unsupported by direct evidence. When long-term nutritional experiments with animals began to be carried out, all manner of unsuspected anomalies appeared very rapidly. No scientist except perhaps Casimir Funk was capable of the necessary credulity to guess how many vitamins there might be. The conservatives began by denying there were any, then gradually and grudgingly admitted the possibility as the long years passed, first of one, then two and so on one by one as a miser parts with his coins. All now concede the existence of a dozen while half as many more are still in the controversial stage.

Most of the earlier animal studies were performed with very much simpler diets than the bulk of humanity consumes. The object of doing so was to keep each article free from significant impurities and thus to ascertain what are the minimum essentials. The method has been amply justified by the discovery of a succession of essential nutrients. The known nutrients in proper proportions now, for the first time, permit a degree of nutrition in the rat which approximates, though it does not equal, the best that can be done with natural food mixtures. We appear to be nearing our goal of a full knowledge of what is essential at least for this one species.

As our knowledge has progressed, several attempts have been made to test the adequacy of customary human diets for the nutrition of the rat. In many instances relatively poor quality human diets have proven poor for the nutrition of the rat by comparison with very simple mixtures of natural foods, even though the latter are given with unvarying monotony for months or years. As an example, rats fed on a poor-class English diet comprising white bread, margarine, tea with milk, boiled cabbage, boiled potato, canned meat and jam, failed miserably. Growth was stunted, the young were badly proportioned, the coats of all were staring and glossless and by the sixtieth day of the experiment they began to kill and eat the weaker members of the colony. At the end of 190 days, corresponding to about sixteen years of the normal life of man, they were sacrificed. Both pulmonary and gastrointestinal disease was found abundantly present on autopsy. By contrast, rats fed a simple mixture of whole wheat and whole milk grew and reproduced through many generations without evidence of abnormality.

McCarrison, who has done more than any one else to evaluate human diets by experiments with rats, has laid special emphasis on the diets of India, where he did his work. As is well known, the peoples of North India are larger in stature and much more muscular and vigorous than those of the southern end of the Deccan peninsula. Rated according to mean stature and weight, seven important racial elements fall in the following order—Sikh, Pathan, Maharatta, Goorkha, Kanarese, Bengali and Madrassi. Their diets range downward by gradations from that of the Sikh, who subsists chiefly on a coarse wheat flour called "atta," a sprouted bean known as "dhal" and milk, including melted butter or ghee. In the South rice with a little fish or meat makes up the food. Rats fed for two years on these diets showed gradations of vigor comparable with those of the Indian peoples. To take a single example of the incidence of disease, peptic ulcer was found in 29 per cent. of the rats fed on the South Indian diet and not a case in those fed the North Indian ration. Similar contrasts were found by the use of other experimental animals.

Modern studies by Orr in England itself indicate that the diets there present almost as wide a range of nutritional excellence, but one can not as readily reduce them to numerical terms, for the diets have not been submitted as systematically to animal experimentation. By all the evidence adduced by Drummond and Wilbraham in the book "500 Years of the Englishman's Food," this contrast in nutritional quality of food is a product of the industrial age. It did not exist to a like degree one hundred years ago, though inadequacy in quantity was then even more prevalent among the poor.

Increasingly it becomes reasonable to suppose that the falling birth rate which characterizes peoples of long-established cultures may be traceable to dietary causes. Food supply has always been a major motive of human striving. When the supply becomes secure as to quantity, there has always appeared historically a marked tendency to adorn it with elegances of selection or of preparation. Just as simplicity of food characterizes primitive cultures, so epicurean delights of the table have characterized declining civilizations.

Experimentally, we know that food may in some degree determine mentality and disposition. In great measure it determines vigor and efficiency. To some degree it influences resistance to infection and therefore death rates. It may demonstrably determine fertility and influence maternal instinct. The chemical bases of sex urges are already in part known, but the relationship, if any, of their genesis to components of the diet is not yet evident.

Will not continuing examination surely reveal whether, or to what extent, food supply has governed the tides of conquest not only by furnishing a prize of war but also by crowding the populations of the aggressors, intensifying their pugnacity and at the same time reducing the birth rates and undermining the vigor of those destined to be vanquished. This thought has grown in part from the observation that of all the peoples of Western Europe to-day, the Germans have practiced the decortication of grain for human use far the least extensively. They have enjoyed a more generous supply of thiamin and other vitamins which grains provide than Scandinavia, the Low Countries, France, Spain, Italy or the British Isles. Perhaps pacifism is a product of malnutrition. If so, malnutrition has its virtues. I prefer to believe that the pacific spirit is a product of democratic organization and that we can perhaps achieve German efficiency and thoroughness without suffering an attack of belligerency.

To associate efficiency with details of food supply may seem to many a far cry. Yet it seems justified at least in part by a recent experiment at Mayo Clinic under the guidance of Dr. Wilder and his associates involving eleven women of the staff. On a diet low in grain vitamins, they became "depressed, irritable, quarrelsome, uncooperative and fearful. Their ability to work suffered because of inattention, uncertain memory and loss of dexterity." Corresponding physical evidences of impairment were noted. "All of these abnormalities, including the anemia, could be corrected only by raising the level of intake of thiamine." Many other competent observers report an increase of buoyancy of spirits and a greater resistance to fatigue achieved by the regular administration of thiamine to people laboring under what are for them normal nervous strains.

In so far as we can approach any social problem from the view-points of physics, chemistry and physiology, we shall be on far more certain ground, for in these fields observations can be made experimentally and objectively to a degree impossible along the lines of sociological approach. It may well be possible to preserve the vigor of youthful civilization without sacrificing the intellectual and cultural advancement of long stabilized societies. There is no sufficient evidence that the decadence of nations is due directly to a weakening of the germ plasm. Germ plasm is a relatively stable inheritance.

The first attempts at reform of mass nutrition have been inaugurated within recent months. They began with the British decision in July of last year that under the stress of war the staple bread of its people should not continue to be emasculated by refining of the grain till its nutritive quality is demonstrably impaired. Like action in the United States was inaugurated last November, partly under the influence of the British example. In both countries, retention of the natural nutrients of the grain is encouraged, but in order that some prompt mass effect should be achieved the use of synthetic restoration of the nutrients is permitted. This has the effect of preserving the whiteness of the bread, a quality still demanded by popular taste, and so avoids the long postponement of an effective remedy. In America three vitamins, thiamin, nicotinic acid and riboflavin, as well as iron, are required to be added to flour or bread which is artificially "enriched." These are nutrients which naturally occur in grain and are known to be more or less widely lacking in the American dietary. While the precise amounts which are to be added are not yet fixed by official regulation, the contemplated quantities are nearly those present in whole grain bread. The progress of the program has been somewhat more rapid in America than was possible in Britain amid the havoc of war. In our country already we are told that half the family flour and a large fraction of bakery bread are enriched in this manner. Those versed in nutrition will eagerly await the first evidences of its reaction on the public health. Many forecast a major betterment as the practice becomes more universal.

This action has been endorsed after extended study by the Food and Nutrition Committee of the National Research Council under the able chairmanship of Dr. Russell M. Wilder. It is a part of a national program of nutritional benefit including popular education, production and distribution to special groups of superior foods and many other phases. There is no intention to resort to general rectification of the food supply with synthetic nutrients. A very few other staples may be favorably considered for such treatment. A special concern is the amplification of the

vitamin A supply, perhaps through butter and butter substitutes, but no runaway wholesale application of our recently acquired knowledge need be feared.

But if the addition of an artificially-made substance to our food can be justified is there any artificial alteration of man's ways of life that must be condemned as a departure from nature? Can one consistently be a progressive in one field and a conservative in another and if so how can one define the boundaries of either?

The discerning biologist will answer that one should be progressive in matters which are subject to preliminary experiment. Among such are those which make up environment. If a mistake should be made in such a matter, its ill effects will be less permanent and can be corrected when the error is discovered. One must be conservative in what can not be forecast by systematic experiment. The latter includes both physical inheritance of the individual and social organization of a nation or race. Since small-scale experiment is slow, broad social decisions have in general rested only on *a priori* reasoning. This is little more than guessing, in testimony of which please note the diametrically opposite views held with great assurance by different schools in sociology, economics. education, etc.

Our environment has been subject to change throughout the period of evolutionary development and is now grossly different from that of primitive man, but the process of natural selection by survival of the fittest is still, so far as we know, the only means of developing a better race or indeed of preventing retrogression. Our present inheritance is the only base from which we can proceed to select further. We may experiment with our environment, using animals in the early stages, but we can not make a trial alteration of our genes. We can even experiment with our own food after extended and judicious experiment with the foods of animals, but we can not experiment on a wholesale scale with our economic structure or our social organization without affecting a nation's future. Social and economic experiment, so called, is often experiment in name only and bears no practical resemblance to experiment in the physical and biological sciences. The latter deals only with a small sample and does not affect the whole.

As I see the evidences of evolution, especially those derived from genetics and from biochemistry, nature's process is one of timeless patience and inexhaustible ingenuity. What more useful lesson can we learn than that nature does not wantonly discard what it has produced but builds ever by adaptation of its earliest concepts. As best we can discern, nature has preserved many mechanisms ever since the process of evolution first began in the mud eons ago. Among these mechanisms are not only those chemical mechanisms of which we have spoken but also those of individual variation and selection of the better adapted by eradication of the worse. Nature's mode has been that of trial on a small scale, a scheme which man rediscovered only some two hundred years ago and dubbed the experimental method. From the conscious application of that method in the fields of the physical and biological sciences has grown the entire product of man's modern mastery of nature.

Society is also, by all evidences, an evolutionary product. We note insect societies of great complexity. Presumably they, like ours, developed because they possessed survival value. So our society should further develop along lines which offer the greatest survival values. Even the spiritual nature of man is an evolutionary product, for we see man's spiritual and intellectual qualities in more elemental and primitive but still recognizable forms in many higher animals. These qualities as well as the social integration toward which they impel us appear to have arisen from submission, one by one of the traits produced by individual variation, to the test of compatibility with the environment.

Only the experimental method, so it seems, offers tangible promise of improving our social and economic structure. But, as in its other applications, experiments in social fields must be on a small scale, even at the risk that each experiment shall be poorly controlled. If so, each man must still be free to follow his own discretion, subject to restraint only when he interferes with the like freedom of his fellows. Love of liberty is not a mere catch phrase but a cosmic wisdom growing out of man's racial experience. His social cooperation in an ideal society must grow with his sense of advantage of cooperation and not by compulsion. His leaders, if they are to be worthy of a following, must appeal not to the sense of immediate advantage of an individual or of his group or class but to the desire of each for the preservation of his freedoms. I submit that all despots, autocrats and Fuehrers, as well as advocates of reform by compulsions, share a common arrogance of opinion in the face of the record of man's upward climb almost, if not quite, exclusively by trying this and trying that, first on a small scale. We may well ask each of those who would save us with a slogan whether it is reasonable to suppose that his advent on the scene marks a turning point in the hundreds of thousands of years of social evolution.

The foregoing is of course an over-simplification. Modern societies are so complex that it is extremely difficult to determine just when one man's freedom begins to infringe another's. What has been said is only the expression of a broad principle which nature

appears to have used consistently throughout the drama of expanding life. The principle is, however, worth enunciating, for the main trends of human thought and action about racial affairs during recent times and especially during the past decade seem definitely in a contrary direction. We are indulging in credulity if we accept panaceas for social ills, if we think to remake human society overnight and most of all if we submit to sweeping changes at the behest of captivating leaders.

Such a view will not be accepted without controversy. Few people are evolutionists in social matters. Prejudices are easily aroused in such affairs especially in the discussion of current questions. To escape these prejudices, we shall do well to look at human history by centuries or by eras and not focus our attention wholly on to-day's headlines. Our American economic history has long been one of booms and depressions and, especially since the Civil War, has involved a series of class subsidies; first, land grants to railroads, then tariffs as protection for manufacturing and, latterly, benefits to agriculture and special privilege for labor. To correct our past over-corrections, we have instituted a score of government regulatory bodies to curb whichever of our past sinful creations happens at the moment to be gaining an ascendancy. Many of the evils can be traced to ancient fictions; for example, that a corporation is a person and its members free from individual responsibility or the idea that a labor union if unincorporated can not be sued. Shall we ever reach the end of regulation short of complete tyranny or inaction unless we return to nature's pattern of individual experiment? To escape anarchy we shall have to have laws, but we should strive to limit these to principles which are nearly universally accepted. Respect for even small minorities is part of the essence of democracy. Such is the view of human society best justified by the perspective of evolution.

Ancient civilizations died apparently of ennui. Depopulation, born perhaps of the substitution of artificial luxury for natural simplicity and heterogeneity of population resulting from the import of elements of subjugated peoples, preceded conquest by more virile neighbors. Whatever the complex causes, a high degree of humanism was not one of them. Our civilization does face this added cause of decay. So long as humane feeling concerns itself only with cultivation of a kindlier sympathy between man and man or class and class, it sweetens the whole of life and enriches culture without doing a direct biological injury. We should not be willing to forego our spiritual aspirations even to assure the physical integrity of posterity. Harshness and cruelty, however, never had a highly selective effect anyhow. Child labor, for example, destroyed good blood as much or more than bad, for it was the industrious and skillful children whose labor was most valued. War and pestilence were also not very discriminating. When, however, humane feeling implements itself with the tools of modern medicine, it does a major biological injury by saving the congenitally unfit. The fit less need its ministrations.

Looking forward then to the decades that shall follow the present cruel and destructive war, biologically intelligent humanity faces first the task of restoring freedom of thought and enterprise, freedom to resume practice of the ancient experimental method. Any other course, no matter how appealing to sentiment or *a priori* reasoning, must only delay the progress of mankind. Artificial restrictions to free interplay must be dispensed with. Trade barriers must be removed between nation and nation. Class legislation which rates men otherwise than according to intrinsic individual worth must be abolished. Artificial subsidies must likewise be set aside. Virtue which can not stand on its own feet in a fair field is dubious virtue; weakness which must forever be protected is ruinous.

Once these principles are popularly accepted perhaps we shall be prepared to begin our second and even more difficult task, to invent means, both scientifically sound *and* humane, to restore or reenforce the process of natural selection for the protection of the future of the race. We can not dismiss this as wholly utopian and impossible. Artificial selection in the breeding of plants and animals is more efficacious and much faster than natural selection ever was because it leaves much less to chance. But the basic tasks of measuring biological excellence, of devising humane measures of restraint of reproduction of the unfit and of promoting the declining reproduction of the desirable will be as challenging to future genetics, biochemistry and medicine as will the equally necessary job of persuading the masses to accept the measures to future sociology and law. The latter will be possible only if we of the scientific fraternity supply tangible objective facts for guidance and for proof. This should not appal us. Are we not the sole conscious practitioners of nature's ancient method of small-scale experiment? Science in its own fields now commands a popular respect almost beyond its deserts. Is it not our duty to urge the use of its uniquely useful tool and method in other fields of human endeavor? Shall we grow impatient if an understanding of its method and an extension of its thought to other fields requires repetition? No, for our responsibilities are race-wide and extend beyond the realm of things into the realm of the spirit of man himself.

OBITUARY

JAMES TROOP

JAMES TROOP, one of America's earliest teachers of entomology, died at the home of his daughter in Urbana, Illinois, on October 14, at the age of 88 years, just three months after the death of his wife at Lafayette, Indiana, his home for 57 years.

Professor Troop was born on March 14, 1853, at Bennington, New York. He graduated from Michigan Agricultural College in 1878, where he was an associate of such notable scientists as Clarence P. Gillette and Liberty Hyde Bailey. The next year he spent in doing post-graduate work at Cornell University and the winter following in study at Harvard. In 1880 Professor Troop returned to Michigan Agricultural College to become a member of the horticultural staff, and received his master of science degree there in 1882.

Troop came to Purdue University in the fall of 1884, retaining his connection with this institution to the day of his death, more than fifty-seven years. When he came to Purdue as head of the department of horticulture and entomology, there was only one other teacher on the agricultural faculty. In addition to entomology and horticulture, he taught forestry, botany and veterinary science. After 28 years as head of horticulture and entomology, the combined department was divided and Troop took over the headship of the entomology department, which he held until 1920, when he became professor emeritus.

From 1899 to 1907 Troop was state entomologist of Indiana, in which position he had charge of regulatory work, including nursery inspection. From 1896 to 1901 he was secretary of the Indiana Horticultural Society, of which he was president in 1933.

Because Professor Troop was a pioneer in the field of horticulture and to a large degree responsible for the development of this industry in Indiana, he was affectionately known as the "Grand Old Man of Indiana Horticulture." Many of the achievements in this field in Indiana may be attributed to his foresightedness and pioneer work.

As a teacher Troop was outstanding, as evidenced by the facts remembered and fond recollections expressed by his many former students.

Aside from his official duties with Purdue University, Professor Troop was active for many years in university and community affairs. He was a charter member of the Purdue Chapters of Alpha Zeta, and Acacia fraternity. He was past commander of the Lafayette Commandery of Knights Templars, of which he was also prelate for thirty-three years. He was active in church circles, being superintendent of the Baptist Church Sunday School and deacon of the same church for many years.

Professor Troop is survived by a daughter Helen, wife of Professor O. H. Sears, of the University of Illinois, and two grandchildren, Marjorie and Gordon Sears.

J. J. DAVIS

PURDUE UNIVERSITY

NORMAN JACKSON HARRAR

January 7, 1902–October 16, 1941

ON October 16, 1941, Dr. Norman Jackson Harrar, chairman of the Chemistry Department of Franklin College, at Franklin College, died of pneumonia. Sulpho-compounds and blood transfusions offered by his students failed to bring about recovery, probably because of his poor health of several years standing.

Harrar was born in Philadelphia, Pennsylvania, on January 7, 1902, and had his early education in that state. Completing his undergraduate studies, he was awarded the B.S. degree with a major in chemistry at the University of Pittsburgh in 1922. Shortly thereafter he went to Colorado and from 1924 to 1927 served as an instructor in chemistry at the Colorado State College in Fort Collins. The year 1927–28, he served as an assistant in chemistry at Pennsylvania State College and was awarded the M.S. degree. Returning West that fall, he served as an assistant in chemistry at the University of Colorado until 1930, at which time he was awarded the Ph.D. degree. During the following two years he was an assistant professor of chemistry at Washington and Lee University at Lexington, Virginia; since 1932 he has served as professor and head of the chemistry department at Franklin College. In 1935 he was chairman of the Indiana Section of the American Chemical Society and in 1937 was chosen as a councilor representing the Indiana Section in the national organization. Following the lead of professional chemists in Pennsylvania, the executive committee of the Indiana Section studied the need of an incorporated organization of the chemists of the state. As a result of this study, the "Indiana Chemical Society" was incorporated in 1939 and Harrar was chosen as its first president. As stated in the constitution, the purpose of the society is "to encourage in the broadest and most liberal manner the advancement of chemistry as a science and as a profession in the state of Indiana, especially in fostering public welfare and education in matters involving chemistry in all its branches and its applications, aiding the development of industry and promoting the health, happiness, and prosperity of the people of the State of Indiana."

Although Dr. Harrar's principal interests were centered in his teaching, he, nevertheless, kept up an

active interest in research, having published a number of papers on the iron cycle in nature dealing with the effect of humic acids on the naturally occurring oxides of iron. He was also interested in studies dealing with salt craving in animals and in arsenic tolerance. Historical studies in the field of chemistry were of most immediate interest to him as evidenced by the publication of a historical paper on "Sulfur from Popocatepetl," and an unfinished manuscript on the history of chemistry. He was a member of the chemical professional society of Alpha Chi Sigma and of Sigma Xi. At the time of his death, he was serving as the coach of the college golf team.

Dr. Harrar is survived by his wife and two sons by a former marriage. In his death science has lost a man of rare ability and a charming personality.

FRANK E. E. GERMANN
UNIVERSITY OF COLORADO

RECENT DEATHS

DR. WALTHER NERNST, formerly professor of physical chemistry and director of the Physico-Chemical Institute of the University of Berlin, Nobel laureate in 1920, died on November 18 at the age of seventy-seven years.

DR. KURT KOFFKA, William Allan Neilson professor of experimental psychology at Smith College, previously from 1911 to 1918 professor of psychology at the University of Giessen, died on November 21. He was fifty-five years old.

MAJOR EDWIN CLARENCE ECKEL, since 1933 chief geologist of the Tennessee Valley Authority, died on November 22 at the age of sixty-seven years.

DR. MAX KRISS, associate professor of animal nutrition at the Pennsylvania State College, with which he had been associated since 1918, died on November 16 at the age of fifty-two years.

SCIENTIFIC EVENTS

THE THAILAND DEPARTMENT OF SCIENCE

THE ninth biennial report of the Thailand Department of Science, which is summarized in the *Journal* of the Council for Scientific and Industrial Research of the Commonwealth of Australia, describes a great increase in the activities of the department. One form of expansion is the addition of a Division of Pharmacy to the Divisions of Chemistry, Agricultural Science and Industrial Chemistry, already in existence. The new division will undertake research into indigenous drugs and the manufacture of certain galenical preparations, and it will examine and standardize drugs and biological preparations imported into, or manufactured in, Thailand. The division is housed in a modern two-storied building containing offices, balance rooms and six laboratories.

The Division of Industrial Chemistry, formerly known as the Division of Technology, was exclusively devoted to the manufacture of Vitamin B_1 extract and drugs for the treatment of leprosy; the Vitamin B_1 extract is obtained from rice bran, and 1,600 litres of it were prepared during the two years under review. A Ceramics Section has now been incorporated in this division, and the workshop attached to the division has been considerably enlarged so that it is able to construct much of the apparatus previously imported or manufactured outside the department. The Division of Agricultural Science is largely engaged on soil surveys and analyses, but it also analyzed various foods and animal fodders, and investigated the fertilizing values of bat and swallow guano. The Division of Chemistry carries out large numbers of routine assays of opium dross submitted by the Excise and Opium Department, and of bronze for coinage, submitted by the Treasury Department. It also has a Water Analysis Section which is growing in magnitude each year as water works are being started in most of the important towns of the kingdom.

The production of solar salt and the production and utilization of soya beans are two important problems that have been investigated by committees set up by the Department of Science. Analyses of Thai soya beans show that their nutritional value is comparable to the Manchurian species.

During 1936–38, six officers of the department were sent abroad to gain experience, principally in the fields of pharmaceutical chemistry, spectrography, ceramics and petroleum refining.

GRANTS MADE TO THE UNIVERSITY OF ILLINOIS

FOURTEEN grants were made to the University of Illinois during April and May, ranging from $300 to $6,250, and amounting in all to $21,170. They are as follows:

John and Mary R. Markle Foundation, New York City, $6,250 to support Dr. Ernst Gellhorn's investigation of the physiological foundations of convulsions and of the treatment of dementia praecox, in the College of Medicine.

Nutrition Research Laboratories, Chicago, $3,900 to continue the research program being carried on in the department of physiology in the College of Medicine under the supervision of Dr. C. I. Reed.

Parke, Davis and Company, $2,000 for research on renal hypertension.

Allied Chemical and Dye Corporation, New York City, $1,500 for the establishment of two fellowships of $750 each, to be awarded to outstanding graduate students in organic chemistry and to be known as Allied Chemical and Dye Corporation Fellowships.

Standard Brands, Inc., of New York, $1,450 for the renewal of their grant under the title of "Yeast Effect on the Digestive Tract," carried on in the department of physiological chemistry, College of Medicine.

American Dry Milk Institute, $950 for research on calcium in foods.

Tennessee Coal, Iron and Railroad Co., $1,450 for research on steel brake shoes.

The New York Community Trust, on behalf of an anonymous client, $960 to pay the stipend of a graduate fellowship in chemistry during the academic year 1941–42. This is a continuation of a fellowship awarded during the last academic year.

The Velsicol Corporation, Chicago, $760 for the support of the researches on insecticides conducted by Dr. Clyde W. Kearns, of the department of entomology.

Niagara Sprayer and Chemical Company, Inc., Middleport, N. Y., $500 for a proposed project on the testing of lead arsenates.

The American Dry Milk Institute, Inc., Chicago, $500 for research work in the department of animal husbandry for biological tests on "enriched bread."

The American Medical Association, $350 for a study of water soluble proteins by Dr. William H. Welker, of the College of Medicine.

A. E. Staley Manufacturing Company, Decatur, $300 for the purpose of carrying on a study of "Sweetose" as used in various dairy products, to be carried on by the department of dairy husbandry.

The Kelco Company, San Diego, California, $300 to cover a study on factors that alter calcium utilization.

Vaughan's Seed Store, Chicago, $300 for a study of the synergistic action of certain organic sulfur compounds when used in an agricultural insecticide.

FELLOWSHIPS IN CHEMISTRY OF THE E. I. DU PONT DE NEMOURS AND COMPANY

E. I. DU PONT DE NEMOURS AND COMPANY have announced the award of six post-doctorate fellowships and twenty-two post-graduate fellowships for research in chemistry for the academic year 1942–43.

A post-graduate fellowship in chemical engineering, as well as one in chemistry, will be awarded this year at the Massachusetts Institute of Technology. The University of North Carolina joins the list of those granted post-graduate awards. Twenty-one institutions in all will benefit. Post-doctorate fellowships are for $2,000 each, and post-graduate fellowships are for $750 each.

The post-doctorate fellowships will be placed under the direction of R. T. Arnold, instructor, University of Minnesota; Paul Bartlett, assistant professor, Harvard University; Ralph Connor, assistant professor, University of Pennsylvania; R. C. Elderfield, assistant professor, Columbia University; C. B. Purves, assistant professor, the Massachusetts Institute of Technology, and H. R. Snyder, instructor, University of Illinois. Appointments to the post-graduate fellowships will be made later in the academic year by the heads of the departments of chemistry of the respective universities.

The twenty-one institutions to which post-graduate awards have been granted are the University of California, University of Chicago, Columbia University, Cornell University, Harvard University, University of Illinois, the Johns Hopkins University, the Massachusetts Institute of Technology, the University of Michigan, the University of Minnesota, the University of North Carolina, Northwestern University, the Ohio State University, Pennsylvania State College, the University of Pennsylvania, Princeton University, Purdue University, Stanford University, University of Virginia, University of Wisconsin and Yale University.

Fellowships for advanced work in chemistry were established by the du Pont Company in 1918, when there was a dearth of men adequately trained for chemical research. Through the fellowship plan, the company sought to prepare promising young men for a career in this phase of science. These grants, which with one interruption have been maintained since 1918, differ from the average industrial fellowship in that the selection of the beneficiary and the subject of research is left to the discretion of the university. There is no actual or implied obligation as to future employment of the fellowship holder.

THE COMMITTEE ON THE PROFESSIONAL TRAINING OF CHEMISTS

THE Committee on the Professional Training of Chemists of the American Chemical Society, of which Professor W. Albert Noyes, Jr., of the University of Rochester, is chairman, has issued a report on progress in which it is said that ten colleges and universities have been added to the list of educational institutions whose work in chemistry has been approved. The total number of accredited schools is now a hundred and two.

A number of institutions have not yet been given formal consideration. For still others action has been deferred, either because the committee wishes to obtain further information or because of pending changes which may alter situations within certain institutions. There has been no intention of specifying the exact content of any course, but merely of

making certain that the student is broadly educated and adequately trained in chemistry.

It is stated in the report that

> The committee recognizes that one of the most important factors in assessing the quality of work in an institution is concerned with the personnel of the staff. It is felt that the staff should be adequately trained and properly qualified to teach chemistry. Institutions which meet merely formal requirements without at the same time having the proper personnel can scarcely be considered to do high quality work.
>
> The committee realizes that many institutions have a very high type of instruction in the elementary chemistry courses, but either through lack of funds or insufficient size of staff, are unable to give the advanced work necessary or are unable to give it adequately for the professional training of chemists.
>
> The committee feels strongly that this type of institution serves a very useful purpose in the American scheme of education and that it would be unwise for such institutions to attempt professional training in the sense that the committee uses that phrase. Graduate schools and employers of chemists will continue to recognize that high quality men soundly trained in the elementary principles of chemistry may be obtained from these institutions, and it should be understood that no stigma is attached to their omission from the list of institutions the committee deems to be qualified for the professional training of chemists.

Institutions will be notified as soon as possible after an unfavorable decision has been reached. These institutions may, upon request, receive from the secretary of the committee a statement of the reasons for such unfavorable action. The institutions on the list will be reviewed from time to time and their fitness to retain recognition will be examined. Any institution for which an unfavorable action has been given may, after an interval of two years following the date of notification of such action, request a review of its situation.

Students who receive the bachelor's degree from accredited institutions become eligible for membership in the American Chemical Society following graduation and two years' experience in the field of chemistry or chemical engineering or in post-graduate study. Students who graduate in chemistry or chemical engineering from other colleges will be eligible only after five years.

The ten institutions added to the accredited list are: Bucknell University; Oklahoma Agricultural and Mechanical College, Stillwater; State College of Washington, Pullman; the Universities of Arizona, Buffalo, Denver, Nevada, Pittsburgh and Vermont, and Williams College.

The Polytechnic Institute of Brooklyn has been accredited for instruction in chemical engineering, following approval by the American Institute of Chemical Engineers. The society has now approved the chemical engineering curricula of forty institutions.

THE INTERNATIONAL CROP IMPROVEMENT ASSOCIATION

THE twenty-third annual meeting of the International Crop Improvement Association will be held at the Morrison Hotel, Chicago, on December 2 and 3. Dr. E. P. Humbert will preside on the morning of December 2 at a symposium to be introduced by a paper on "A National Policy on Plant Disease Control," by Dr. C. R. Orton, of the West Virginia Agricultural Experiment Station. "The Effect of Seed-borne Diseases on Germination" will be discussed by Dr. W. S. Crozier, of the New York Experiment Station, and problems of seed-borne diseases of particular crops will be reviewed by Dr. R. W. Goss, of the Nebraska Experiment Station, for the Irish potato; Dr. Koehler, of the Illinois Experiment Station, for small grains and corn, and Dr. W. N. Ezekiel, of the Texas Experiment Station, for cotton.

The afternoon session will open with a discussion of "Methods of Applying Seed-borne Disease Control Measures," to be led by Dr. M. A. McCall. "The Determination of Wheat Varieties by Kernel Characteristics and Its Commercial Use" will be presented by F. T. Dines, and O. S. Fisher will give "Progress Report on Certifying Agencies" also during the afternoon session.

The annual banquet will include the address by President A. L. Clapp, an address by R. L. Throckmorton on "Seed Certification—A National Asset," and movies on "Seed Certification in Nebraska" will be shown by E. F. Frolik. The program concludes with a business meeting and committee reports on December 3.

MEETINGS ON TROPICAL MEDICINE AT ST. LOUIS

THE thirty-seventh annual meeting of the American Society of Tropical Medicine was held conjointly with the Southern Medical Association in St. Louis, Mo., from November 10 to 13. Special features of this meeting included the Sixth Charles Franklin Craig Lecture on Tropical Medicine given by Dr. K. F. Meyer, of the George Williams Hooper Foundation, San Francisco, entitled "The Known and the Unknown in Plague"; and, as already reported in SCIENCE, the first Bailey K. Ashford Award in Tropical Medicine was awarded to Dr. Lloyd E. Rozeboom, of the School of Hygiene and Public Health of the Johns Hopkins University. Dr. Thomas T. Mackie, of New York, delivered his presidential address on "Observations on the Early History of Tropical Medicine" at the annual luncheon of the society. A joint session with the National Malaria Society was held.

The officers elected include:

President, Dr. Ernest Carroll Faust, New Orleans, La.
President-elect, Dr. N. Paul Hudson, Columbus, Ohio.
Vice-president, Dr. Joseph S. D'Antoni, New Orleans, La.
Editor, Colonel Charles F. Craig, San Antonio, Texas.
Secretary-Treasurer, Dr. E. Harold Hinman, Wilson Dam, Ala.
Councilors (for 4 years), Dr. Andrew J. Warren, New York, N. Y.; Colonel James S. Simmons, Washington, D. C.
Member of Editorial Board, Dr. Justin Andrews, Atlanta, Ga. (for 5 years).

In conjunction with the Society of Tropical Medicine and the Southern Medical Association the eighth annual meeting of the American Academy of Tropical Medicine was held on November 12. At the dinner session Dr. Marshall A. Barber delivered the annual presidential address on "The Human Side of Malaria Research." Dr. W. W. Cort presented the Theobald Smith Gold Medal of the George Washington University to Admiral E. R. Stitt, M. C., U. S. N., retired.

Dr. Marshall C. Balfour, International Health Division, Rockefeller Foundation, and Dr. Rolla E. Dyer, chief of the Division of Infectious Diseases, the National Institute of Health, were elected to membership. Dr. C. C. Bass and Dr. L. O. Howard were elected emeritus members. The following officers and a five-year councilor were elected for the year 1942:

President, Dr. H. C. Clark.
Vice-president, Dr. L. W. Hackett.
Treasurer, Dr. T. T. Mackie.
Secretary, Dr. E. C. Faust.
Councilor, Dr. A. C. Chandler.

SCIENTIFIC NOTES AND NEWS

THE autumn general meeting of the American Philosophical Society, Philadelphia, was held on November 21 and 22. The evening lecture, entitled "Military Aspects of the Arctic," was given by Dr. Vilhjalmur Stefansson, the Arctic explorer.

THE Mead Johnson Awards for 1941 were announced at the annual meeting in Boston of the American Academy of Pediatrics. Dr. René J. Dubos, of the Rockefeller Institute for Medical Research, received the first award of $500 for his work leading to the development of gramicidin, used for the treatment of disease caused by pathogenic bacteria, and Dr. Albert B. Sabin, associate professor of pediatrics in the College of Medicine of the University of Cincinnati, received the second award of $300 for research in diseases of the nervous system caused by viruses.

VICE-PRESIDENT HENRY A. WALLACE will be decorated by the president of Cuba with the order of Carlos J. Finlay on December 3, during his visit to Cuba to attend meetings during which the Finlay Institute of the Americas will be inaugurated.

THE *Journal* of the American Medical Association reports that Dr. Rudolph Matas, professor of general and clinical surgery, emeritus, of the School of Medicine of the Tulane University of Louisiana, was presented on October 25 with *The Times-Picayune* Loving Cup for 1940 "in recognition of his years of unselfish service to his fellowman."

A DINNER in honor of Dr. Joseph C. Beck, professor emeritus of otolaryngology of the College of Medicine of the University of Illinois, was given on September 26. Dr. Beck was presented with a statue of himself which recently won a prize at the exhibit of the American Physicians Art Association in Cleveland. The statue is the work of Dr. Adolph M. Brown.

EDWARD WESP, JR., a senior in the College of Engineering of New York University, has been awarded the Daniel W. Mead Prize—a certificate and $50—of the American Society of Civil Engineers in recognition of his paper entitled "Ethics of the Engineer Inspector." The presentation will be made at the annual meeting of the society in January. The contestants included students in a hundred and twenty colleges throughout the country.

AT the annual dinner sponsored by the Chemical Control Committee of the National Fertilizer Association which was given on the evening of October 27, F. B. Carpenter, chief chemist of the Virginia-Carolina Chemical Corporation, presented a silver water pitcher and tray to E. W. Magruder, chief chemist of the F. S. Royster Guano Company, who originated the check fertilizer series in 1922.

DR. GEORGE R. MINOT, professor of medicine at the Harvard Medical School, has been elected president of the International Medical Assembly and president of the Inter-State Postgraduate Medical Association of America.

DR. EUGENE MCAULIFFE, of Omaha, Nebr., has been elected president of the American Institute of Mining and Metallurgical Engineers. He will take office in February at the annual meeting of the institute in New York.

DR. OREN A. OLIVER, of Nashville, Tenn., was elected president, and Dr. J. Ben Robinson, of Baltimore,

was made president-elect, of the American Dental Association at the Houston meeting.

Museum News reports that E. A. Gallup, of Ann Arbor, Mich., was elected president of the American Institute of Park Executives at the New Orleans meeting in October; Donald Wyman, Arnold Arboretum, was elected a director for three years. Officers for the American Association of Zoological Parks and Aquariums elected at the same time are as follows: Freeman M. Shelly, Philadelphia Zoological Garden, *chairman;* John T. Millen, Detroit Zoological Garden, *vice-chairman;* Tod Raper, Columbus *Dispatch, secretary;* Mrs. Belle J. Benchley, San Diego Zoological Society, and W. R. Sprott, Little Rock Zoo, *directors.* All officers for the American Association of Botanical Gardens and Arboretums were reelected.

PROFESSOR ALFRED H. WHITE, of the University of Michigan, president of the Society for the Promotion of Engineering Education, has resigned as chairman of the Michigan department of chemical and metallurgical engineering. He is succeeded as head of the department by Professor George E. Brown.

DR. PIERRE AUGER, professor of physics in the Ecole Normale Supérieure of the University of Paris, who is known for his work on cosmic rays, has been appointed research associate in physics at the University of Chicago. Dr. Auger conducted his laboratory in Paris for more than a year after the German occupation. He left the city on October 3 on official leave from the Vichy Government. He plans to accompany an expedition for cosmic-ray study which next summer will visit the research station on the summit of Mt. Evans in Colorado.

DR. CHARLES W. HUNTLEY has been appointed dean of Adelbert College, Western Reserve University. Dr. Huntley has been instructor in psychology at Mather College, Western Reserve University; he will now hold the rank of assistant professor of psychology in Adelbert College and will continue to teach psychology in both colleges.

DR. J. W. TREVAN, director of the Wellcome Physiological Research Laboratories, London, has been elected a director of the Wellcome Foundation, Ltd.

DR. JOHN SUNDWALL, director of the Division of Hygiene and Public Health of the University of Michigan, has been given leave of absence for the second semester.

DR. JOHN EVERETT GORDON, Charles Wilder professor of medicine and epidemiology of the Harvard Medical School, director of the American Red Cross Harvard Hospital Unit in southwestern England, arrived in New York on November 10 on the Atlantic Clipper, for a vacation and to recruit American staff members for the unit. He expects to return to gland in about a month.

SEÑOR MARCELINO A. CERIALE, director of the tional standardizing body of Argentina, will visit United States in February or March as a guest of American Standards Association. The purpose the trip is to further friendly relations between United States and Argentina by giving him an portunity to study at first hand the development American industrial practices and standards. A his stay in Washington, he will visit manufactu centers in Philadelphia, Detroit, Chicago, Sche tady, etc. Steps have been taken to found a S American Committee for Technical Standards, the purpose of stimulating the organization of tional standardizing bodies and ultimately of ha an influence on international trade. This comm held its first meeting last month in Rio de Janei

DR. PETER DEBYE, chairman of the departmen chemistry of Cornell University, will speak on " Magnetic Approach to the Absolute Zero of T perature" on December 3 at a joint meeting of Franklin Institute with the Physics Club and Phy Colloquium of Philadelphia.

DR. GEORGE H. WHIPPLE, dean and professor pathology of the School of Medicine and Dentis of the University of Rochester, delivered on Nov ber 28 the sixteenth Pasteur Lecture of the Insti of Medicine of Chicago at a joint meeting with Illinois Section of the Society for Experime Biology and Medicine. His subject was "The P duction, Utilization and Interrelation of Blood P teins—Hemoglobin and Plasma Proteins."

ON account of war conditions, Dr. Elmer V. Collum, professor of biochemistry at the School Hygiene and Public Health of the Johns Hopk University, will deliver at the University of Toro on December 1, 2 and 3 the Harben Lectures of Royal Institute of Public Health and Hygiene. general subject will be "Nutritional Science and P lic Health."

DR. R. RUGGLES GATES, of the University of L don, lectured at Vassar College on November 12 "Heredity and Environment in Human Genetics" at Dartmouth College on November 13 on "Hu Genetics and Race."

BEGINNING on November 5 and ending on Janu 21 a series of lectures on tropical medicine will presented at the School of Tropical Medicine, San Juan, Puerto Rico, by various members of the partment of medicine. The lectures will be given Drs. Ramon M. Suarez, head of the department

R. Rodriguez-Mollina and by Dr. F. Hernandez les.

A COMPREHENSIVE survey of employment, unemment and related labor conditions is being con- in St. Paul, Minn., by the Employment Stabili- Research Institute of the University of Minne- of which Dean R. A. Stevens is director. The nt study is jointly directed by Professor Dale r, of the School of Business Administration, and ssor Donald G. Paterson, of the department of hology. Professor R. L. Kozelka is assisting as lting statistician. The work is being financed grant of $50,450 from the Rockefeller Foun- n.

THE twenty-eighth Congress of Americanists will eld in Santiago, Chile, in March.

A MEETING of the northern California section of Institute of Food Technologists will be held on mber 4 under the presidency of B. E. Lesley, of California Packing Corporation. Dr. T. L. Swenson, director of the Albany Regional Research Laboratory of the U. S. Department of Agriculture, will preside at the dinner, and Dr. J. Murray Luck, of Stanford University, will speak on Great Britain's food supply.

THE twenty-sixth annual dinner and meeting of the Institute of Medicine of Chicago will be held at the Stevens Hotel on December 2. The presidential address will be delivered by Dr. Rollin T. Woodyatt on "The Story of Acidosis."

THE Southern District meeting of the American Institute of Electrical Engineers will be held at New Orleans from December 3 to 5.

THE next meeting of the trustees of the Elizabeth Thompson Science Fund will be held in April, 1942. Previous awards from the fund were reported in SCIENCE on May 16, 1941, and earlier. Applications for grants should be made to the secretary, Dr. Jeffries Wyman, Jr., Biological Laboratories, Harvard University, Cambridge, Mass.

DISCUSSION

UNRECOGNIZED ARID HAWAIIAN SOIL EROSION

WATER is the most important product of the forests Oahu island, and forage is the most important uct from the large areas of non-forested and non- cultural lands of this and other Hawaiian islands. continued production of these resources is inti- ly dependent on soil for absorption and percola- of the precipitation. Absorbed water is necessary the continuance of plant growth *in situ*. Water olated through the lava beds maintains the supply is obtained from an elaborate system of tunnels wells, and which is used for agricultural and n purposes. Water neither absorbed nor perco- is largely surface runoff, which feeds the streams generally flows to the sea, unused by man. The tion of the high rainfall for the production of ge and of usable water is therefore seen to depend the maintenance and preservation of the soil tle. Soil erosion is thus a critical factor in the omy and production of a country which is be- ing increasingly important to the welfare of con- ntal United States.

The United States may justly boast that it is the nation in history to recognize incipient stages of erosion and to institute elaborate and effective agement methods for the perpetuation of the soil tle under active land uses.[1, 2] The United States thermore is largely responsible for the recognition in northern Africa and southwestern Asia of the direful results of unchecked soil erosion and the poverty of land stripped to bed-rock and without the mediating influence of developed soil and vegetation.

Americans, however, need not have gone to other flags to find lands in which erosion had proceeded unchecked, and where, with no more soil to erode, a new equilibrium has been attained as stricken as areas in Africa and Asia known to the author. Since N. E. Winters[3] states that "The problem of soil erosion is not so wide-spread and serious in Hawaii as it is on the mainland of the United States," he is obviously referring to areas in which erosion is now actively occurring and which locally may be as striking as that of our southeastern Piedmont.

Adjacent to these eroding lands in Hawaii and in areas of lower precipitation and lower elevation is a zone, admittedly often narrow on Oahu but widespread on other islands, where soil no longer remains and where the annual increment of rock weathering is not retained by the stable sparse vegetation, but is removed by surface runoff. The theory that these lower arid slopes once bore heavy soil mantles capable of supporting a more luxuriant vegetation than that now existing depends on five lines of evidence: (1) the existence of several relict soil mats, stable on the surface, but eroding rapidly at the margins by undercutting; (2) a stage of rapid alluviation in many valleys which in some cases has buried still living trees to their crowns; (3) the development of narrow

[1] H. H. Bennett, Science Supplement, 94: 2429, 8, 1941.
[2] W. C. Lowdermilk, *loc. cit.*
[3] N. E. Winters, *Hawaii Territorial Planning Board Progress Report*, 81–82, 1939.

coastal plains known to have been built by recent sedimentation from the hills; (4) the existence of indigenous floristic elements which could develop a more mesic soil-holding vegetation; (5) the inability of such species to maintain a vegetation in the face of grazing and fire.

Reparation of a region in which soil erosion has been carried to its ultimate conclusion may demand the application of methods quite different from those where it is desired merely to reduce accelerated erosion to normal erosion. Present techniques of reforestation in this zone have not been successful and an intimate knowledge of the requirements of soil-binding species and of a complex plant succession are necessary. The problem commands the ingenuity of conservationists, and upon it hinges the greatly increased productiveness of large acreages in a country where productiveness is becoming more critical.

This consideration of soil erosion in arid Hawaii is based upon field investigations on Oahu during 1936–37 while the author was research fellow of Yale University and the Bishop Museum (Honolulu). The interpretation has been strengthened by subsequent work of the author in this and other countries. The vegetational aspects of the problem are being discussed in a manuscript now in preparation.

FRANK E. EGLER
NEW YORK STATE COLLEGE OF FORESTRY,
SYRACUSE

CONCERNING GASTROPODS ADHERING TO FOREIGN OBJECTS

IN the discussion of *Potadoma agglutinans*, a melaniid snail from the Congo Estuary which cements itself to rocks, we stated that we knew of no other comparable case among fresh-water Gastropoda.[1] In a recent conversation, Dr. Teng-Chien Yen called our attention to the small Chinese "enigmatic shells" described by E. Lamy as *Helicostoa sinensis*.[2] It is interesting to compare this mollusk with our *P. agglutinans*. The flattened, disk-like snail of *H. sinensis* adheres by one of its faces to the free surface of immersed rocks, apparently soon after hatching. At first it is normally coiled, but the spiral eventually spreads out and becomes irregular, much as in certain species of the marine genus *Vermetus*. The mode of adherence is therefore different from that of *Potadoma agglutinans*, which remains turreted, although much deformed, and adheres only where it presses against foreign objects as growth progresses. The smaller, young snails of *Helicostoa* appear to be of two types and the largest, presumably adult snails, reach 10 to 12 mm in diameter. Lamy recognized that *Helicostoa* was operculated, but did not attempt to place it in any of the known families. More recently, Mrs. A. Pruvot-Fol described the operculum, tentacles and radula from the original material.[3] She proposed for *Helicostoa* a special family Helicostoidae, of the *Prosobranchiata taenioglossa*. She also suggested that the two forms of the young snails were the two sexes, the tentacles and radula being present only in one of them, presumably the male. It would seem to us that the soft parts and radula of *Helicostoa* agree sufficiently with those of either Valvatidae or Bulimidae (Hydrobiidae), the radula being insufficiently known to decide between the two. It is unfortunate that the precise habitat and ecology of this snail are unknown. It was described from specimens attached to a limestone rock labeled merely "Kouei-Tcheou," a city on the upper Yangtse Kiang, more than 1,200 kilometers from Shanghai. It may be surmised that the rock was immersed in swiftly running water, either on the banks of the Yangtse Kiang itself or in the rapids of one of its smaller affluents. The present note is written for the purpose of interesting Chinese naturalists in this remarkable snail. Moreover, a thorough investigation of its habitat may well lead to the discovery of other equally interesting types of rheophilous mollusks, similar to those known from the swift waters of the Congo Estuary.

J. BEQUAERT
W. J. CLENCH
MUSEUM OF COMPARATIVE ZOOLOGY,
CAMBRIDGE, MASS.

ANOPHELES MACULIPENNIS MEIGEN AND ANOPHELES PUNCTIPENNIS SAY FROM NORTH DAKOTA

Two species of malaria-carrying mosquitoes have been found in North Dakota. Specimens of *Anopheles maculipennis* were taken by the authors in fairly large numbers under a concrete bridge over a swampy marsh near Grand Forks on September 20, 1941. Additional specimens of *Anopheles maculipennis* and three specimens of *Anopheles punctipennis* were collected from the ceilings and walls of outhouses in a park near Hillsboro on the same day. The presence of these mosquitoes in the state is not surprising in view of the fact that these species are known to occur in Manitoba and the states surrounding North Dakota.

H. S. TELFORD
CLIFFORD WESTER
NORTH DAKOTA AGRICULTURAL
EXPERIMENT STATION

COLLEGES AND THE CHANGING HIGH SCHOOLS

THE article entitled "Colleges and the Changing High Schools," by M. H. Trytten, under "Discussion"

[1] *Bull. Mus. Comp. Zool.*, 88: 3, 1941.
[2] *Jour. de Conchyl.*, 70: 51–56, 1926.
[3] *Bull. Soc. Zool. France*, 62: 250–257, 1937.

in the issue of SCIENCE of October 24, 1941, quotes me so inaccurately.

It is stated (page 389) with a footnote reference to the *New York Times,* "Dr. S. R. Powers . . . describes the results of a five-year survey. . . ." I have never at any time written for this newspaper. The description referred to was done by a staff reporter of the newspaper and printed under the reporter's name. The statements that "conventional treatment of science will go by the board" and about "scrambled courses," although attributed to me in the newspaper article, were not made by me and do not represent my views even approximately. In general the statements are meaningless when subjected to scrutiny and are irrelevant to the work that is being done under my direction.

The work in progress is carried on under an organization known as the Bureau of Educational Research in Science, of Teachers College, Columbia University, with cooperation of well-trained critically minded high-school teachers and with advice and assistance from scientific men with impeccable reputations as teachers and research workers. Further information about the work of the bureau may be had from the *Teachers College Record,* January, 1939; *Report of the Dean of Teachers College,* 1940; *General Education Board Annual Report,* 1939 and 1940; and from the bureau's publications obtainable through the Bureau of Publications, Teachers College, Columbia University.

S. R. POWERS

TEACHERS COLLEGE,
COLUMBIA UNIVERSITY

THE COMPARATIVE COST OF LOAN SERVICE AND OF MICROFILM COPYING IN LIBRARIES

IN a discussion[1] of "The Place of Microfilm Copying in Library Organization," the view was expressed that this method of rendering library service might be organized in a manner that would permit its operation at no greater cost than that of lending books. An opportunity to examine this question more carefully has since been obtained and the expectation has been confirmed that the actual cost of these two methods of rendering library service is not very different.

In regard to the cost of making microfilms an analysis[2] of the operation of Medicofilm Service showed that in groups of 100 orders the total expenditure for materials and work at the wage rate of $1.00 per hour was $17.25 or 17¼ cents per microfilm. This included the time required to obtain the books from the shelves and to replace them after use, as well as that devoted to verifying the film copies and mailing them out, but did not include the time required for keeping the accounts and collecting for the work done.

Although the extent and practice in regard to lending books varies greatly in different libraries, the experience in the Army Medical Library of Washington is probably typical of many of the larger reference libraries. In this library one employee, devoting her entire time to this work, keeps the records of all books which go out on loan. Others obtain them from the shelves and replace them when returned. Furthermore, the wrapping and mailing is attended to by a library messenger. During the last five years the following number of books have been loaned annually:

Year	Number loaned
1936	12,919
1937	13,886
1938	14,104
1939	13,128
1940	14,000

Average, 13,607

Of these, about 20 per cent. go to local governmental institutions and are called for by messengers and the remainder are sent and returned by mail for which the postage is prepaid by the borrower.

The working schedule in governmental departments is 44 hours per week, which with deductions for holidays and annual leave corresponds to 2,068 hours per year. On the basis of wages at $1.00 per hour, the actual cost per book loaned is $2,068 ÷ 13,607 = $.15. If to this is added the 3 cents which is the cost of obtaining each book used for microfilming and replacing it on the shelf as well as the cost of wrapping supplies and messenger service for 80 per cent. of the books loaned, the total cost is appreciably higher than that of making and sending out microfilm copies.

There are, of course, advantages and disadvantages in both of these methods of rendering library service. From the standpoint of the borrower it is evident that those who have not yet become accustomed to using microfilms will object to receiving one in lieu of the loan of the book itself. Others, however, will appreciate the advantage of being able to keep the microfilm copy. From the standpoint of library operation there is little doubt that microfilm service has outstanding advantages in permitting the collections to remain intact for their more uninterrupted use as well as reducing wear and tear of the books.

The evidence here presented shows that libraries could substitute free microfilm service to the same extent that free lending service is now rendered without increasing the cost of operation. If the demand for microfilms increased sufficiently to tax the funds available for this purpose, a very small charge for the microfilms would probably be sufficient to keep expenses within the allotments for this feature of

[1] Seidell, SCIENCE, 94: 114–5, August 1, 1941.
[2] Seidell, *Jour. Documentary Reproduction,* 4: No. 3, September, 1941.

library service. In this manner it would be possible for many reference libraries to extend the scope of their usefulness far beyond their present limits. Lastly, the lessened cost of rebinding books due to wear and tear in transit through the mails, represents a factor of great importance in estimating savings made by the wide use of the microfilm.

ATHERTON SEIDELL
MEDICOFILM SERVICE,
ARMY MEDICAL LIBRARY

QUOTATIONS

PROBLEMS CONFRONTING MEDICAL INVESTIGATORS

IN a recent address at the fiftieth anniversary celebration of Stanford University, Dr. Walter B. Cannon[1] presented some questions which deserve careful study. The shift in age grouping of the population, with increasing percentages of the elderly and the aged, now widely recognized as a fact, has presented the medical profession with a series of new problems. As one grows older, Cannon points out, the fires of life burn less vigorously and the adjustments of bodily organs to emergencies tend to be impaired—the breath is shorter, the heart beats less effectively, blood pressure gradually rises as the years pass and becomes ill adapted to critical requirements. Are these features essential attributes of the elderly or are they the consequences of comfortable and habitual indolence? In middle age some of these effects may result from inactivity alone and can be reversed by training; is this true in the later decades? If so, should attempts be made to alter them? What, Cannon says, would be the effects if they were altered? These questions offer possibilities for useful research. Almost none of the most prominent disorders of senescence are thoroughly understood. The prevailing ignorance, it may be assumed, is largely due to lack of systematic study. The challenge presented by realization of this fact will doubtless receive many answers. Severe demands on the nervous system, which may have arisen in part from the remarkable shift in the occupation of the citizens, often result in calls for medical attention. A disorder of the brain may fail to be revealed at necropsy or under the microscope. And yet emotional upsets which leave in the nervous pathways no visible trace have concrete and obvious effects and may be the occasion for profound misery and suffering. The gradual onset of disabilities, bodily and mental, in the later years of life demands, Cannon believes, long-range studies on the possible influence of inheritance, early injuries, severe infections in childhood and youth, frustrated plans, the demands of labor and probably many other conditioning experiences. Cannon also calls attention to the disastrous cooperation of disease, pain and early death when warring hosts or nations battle against nations for supremacy. International developments unquestionably have affected medical research in a warping of scientific activities away from untrammeled pursuits toward problems of military significance. Medical investigators, however, by learning the nature and cure of malnutrition, by devising appropriate treatment for shock and hemorrhage and in many other ways have served to mitigate the torments and ravages of warfare. One of the results of the present war already has been a more intimate association of a highly desirable nature with medical investigators in Latin American nations. Finally Cannon emphasizes as one of the biggest problems facing medical investigators the filling of their own ranks. This is indeed primary, and, unless well-equipped recruits can be attracted to the career of the investigator, progress will end. Cannon dwells at some length on the attractions and rewards of medical investigators, pointing out particularly one consideration eminently creditable to their efforts: "Because life and health are precious and medical research is deeply concerned with protecting life and health, the triumphs of that research are put to use without regard to any national or racial difference. . . . Even though the beneficiaries may despise their benefactors, they must receive the benefactions. . . . The conquest of a disease, it should be remembered, is a permanent conquest."—*The Journal of the American Medical Association.*

SCIENTIFIC BOOKS

THE LABORATORY MOUSE

Biology of the Laboratory Mouse. By the STAFF of the Roscoe B. Jackson Memorial Laboratory, with a chapter on Infectious Diseases of Mice by J. H. DINGLE, Harvard Medical School. Philadelphia: Blakiston Company. 1941.

THIS book is the joint work of the staff of the Roscoe B. Jackson Laboratory, under the editorship of G. D. Snell. Some chapters are short monographs on subjects in the investigations of which the Jackson Laboratory has prominently participated, while other

[1] W. B. Cannon, "Problems Confronting Medical Investigators," SCIENCE, 94: 171–179, August 22, 1941.

chapters are written more in a text-book-like fashion, summarizing wider fields of the literature. But even in the latter, investigations of the various authors were added to the study of the literature, as, for instance, in the chapter on the early embryology of the mouse by Snell, but also in the chapters on reproduction by Snell, on histology by Elizabeth Fekete, and on spontaneous neoplasms in mice by A. M. Cloudman. There are valuable contributions on parasites by W. E. Heston, and on infectious diseases in mice by J. H. Dingle. Throughout, the illustrations of these chapters are numerous and excellent. To all investigators who work with the mouse, this part of the book will be very helpful; the chapter on the histology of this species will be especially helpful, because the general text-books on histology do not as a rule contain the information needed by the student of this particular species.

The remaining chapters are short monographs dealing largely with work from the Jackson Laboratory. They concern investigations about which there might be differences of opinion. The chapter on gene and chromosome mutations by Snell will prove very useful for geneticists. The chapter on endocrine secretion and tumor formation by G. W. Woolley is a very good summary of our knowledge in this field, although the presentation is rather condensed. One might wish also that the chapter on the milk influence on tumor formation, written by J. J. Bittner, who discovered this interesting condition, might have been somewhat more detailed. It treats of a new, virus-like substance, which is of considerable importance in the etiology of the mammary gland carcinoma in mice, and which is present in the milk and certain organs of mice belonging to strains in which the incidence of this type of cancer is high. It is designated as the "extrachromosomal factor" in order to distinguish it from genetic factors which also have a part in the development of tumors.

The chapters on the genetics of spontaneous tumor formation and on the genetics of tumor transplantation, written by Little, are valuable summaries of the many interesting investigations of Little and his collaborators, in which they used closely inbred strains of mice; and by making this material accessible to other investigators, they have aided cancer research in many other laboratories. As might be expected, some of the views expressed in these chapters are controversial. To mention only some of these points: It is doubtful whether there exists an absolute distinction between these closely inbred strains and the strains used by earlier investigators, a number of which were also, to some degree, inbred. There are only quantitative differences between these various types of strains, and notwithstanding the larger number of variable factors with which the earlier investigators had to contend, they were able to establish some of the principal facts concerning the hereditary conditions underlying the origin as well as the transplantability of cancer. As early as 1912 it was suggested that the results obtained in the transplantation of tumors could be explained on the basis of Mendelian rules, by assuming the presence of multiple factors in the sense in which Nilsson-Ehle and other geneticists had used this term. However, even to-day no definite knowledge exists concerning the mode of hereditary transmission of the genetic factors active in the origin of mammary gland carcinoma of the mouse.

As to the criticism which Little has raised against the theory of the individuality differential, the justification for this criticism may be questioned; it might be held that the success or lack of success of tumor transplantations which Little has used in the analysis of individuality is not suited for this purpose. A successful transplantation of cancerous tissue is a threshold phenomenon and differs from the results in transplantations of normal tissues, which represent graded series of reactions of the host, which can be shown to correspond to the graded character of the individuality differentials in various organisms. The transplantations of normal spleen which Little and Bittner carried out in a few experiments were not controlled by microscopic examination. Furthermore, it is doubtful whether the method used for the determination of the number of factors on which the transplantability of tumors is supposed to depend furnishes valid results. The importance of such determinations may also be doubted, because the number of factors found would vary with each different combination of tumor and host. There are also serious objections to the conclusion that somatic mutations in tumors play the significant role in the transplantability and also in the origin of tumors which is attributed to this factor by Little and his collaborators.

The chapter on inbred and hybrid animals and their value in research (W. L. Russell) is a very instructive and clearly written presentation of somewhat intricate genetic problems. The term "specificity of tissues" is here, as well as in other chapters, substituted for the term "individuality differential." It is not certain that this change is advantageous. The specificity of tissues comprises several conditions, only one of which can be correlated with the individuality differential. The short chapter on the care and recording of mice colonies written by Bittner contains some very good advice for those who are interested in the breeding of these animals for scientific purposes.

Altogether, this is an excellent book, and by writing it the staff of the Jackson Laboratory has made an-

other distinctive contribution. It will be very helpful to investigators in the fields of genetics, tumors, endocrinology, as well as pathology and biology in general.

LEO LOEB

SCHOOL OF MEDICINE,
WASHINGTON UNIVERSITY,
ST. LOUIS

MATHEMATICS

University Mathematical Texts. General editors, Alexander C. Aitken, D.Sc., F.R.S., Daniel Rutherford, Dr. Math. Edinburgh and London: Oliver and Boyd. New York: Interscience. *Determinants and Matrices,* by A. C. AITKEN; *Statistical Mathematics,* by A. C. AITKEN; *Waves,* by C. A. COULSON; *Integration,* by R. P. GILLESPIE; *Integration of Ordinary Differential Equations,* by E. L. INCE; *Functions of a Complex Variable,* by E. G. PHILLIPS; *Vector Methods,* by D. E. RUTHERFORD; *Theory of Equations,* by H. W. TURNBULL. Each volume, $1.50.

IN continental Europe the publishing of brief introductory texts at a low price has long been an established custom. It is very fortunate that, by constructive editorial activity, the present mathematical series in the English language was started. All the little books of the series published so far can be characterized as unassuming, straightforward, directed toward tangible facts rather than toward generalities, conscious of applications, and written by competent authors. They can not possibly give more than introductory information and they can not suffice as bases for more detailed studies. But within the limitations imposed by their small size (about 65,000 words on the average), they will serve a really useful purpose. It is to be hoped that the editors will be able to maintain the same standards in the future publications of the series.

A Treatise on Advanced Calculus. By PHILIP FRANKLIN, Ph.D., professor of mathematics, Massachusetts Institute of Technology. xiv + 595 pages. New York: John Wiley and Sons. 1940.

RIGOR, whatever this word may mean, was one of the great mathematical achievements of the nineteenth century. Only gradually has this tendency penetrated into text-books. The first great work of this kind, Jordan's "Cours d'analyse," was followed by many others, of which Hardy's "Pure Mathematics" seems to be the foremost in English. Franklin's book is an admirable attempt on a much broader scale to combine rigor with completeness in a volume of modest size. It will appeal to readers who are already well informed but want to revise and to supplement their knowledge in the light of modern precision. Not only are the traditional subjects of a book on advanced calculus covered, but also many more advanced topics are included. There is a section on the Laplace transformation, one on Poisson's sum formula, and a brief exposition of the theory of partial differential equations of the first order. The material is presented in an original way with extraordinary care.

Of course it is impossible to discuss analysis from the real number system to the Hamilton-Jacobi theory in less than 600 pages without being somewhat dogmatic. The reader who wants to absorb new material will miss a convincing illumination of motives and goal for all these deductions. The critic may take exception to points where the personal taste of the author has asserted itself in a striking way, such as in the discussion of the trigonometric functions. Or he might be disappointed to find in such a thoughtfully precise book an introductory remark on limits, where the idea of a steadily moving independent variable is mentioned without being explicitly disavowed. From Zeno to Leibniz this concept has been one of the main impediments to rigorous mathematical treatment, and its replacement by "static" concepts was the decisive step towards logical clarity in the modern definitions of limit and continuity. Of course such criticism of minor details does not matter much in view of the merits of the book as a reliable guide. The great effort embodied in this work will certainly assure it a more than transitory place in the literature and a lasting influence on those for whom it is written.

R. COURANT

NEW YORK UNIVERSITY

SPECIAL ARTICLES

THE EFFECT OF SULFANILYLGUANIDINE ON THE THYROID OF THE RAT[1]

FOLLOWING the announcement of Marshall *et al.*[2] that orally administered sulfaguanidine (sulfanilylguanidine) reduces the concentration of coliform bacteria in the feces of mice, we investigated the possibility that this substance, when fed to rats on a purified diet containing synthetic B vitamins, would prevent the synthesis of additional essential nutrients by the intestinal flora. In view of Woods's[3] finding that p-amino benzoic acid interferes with the bacteriostatic

[1] Supported by a grant from The Rockefeller Foundation.

[2] E. K. Marshall, Jr., A. C. Bratton, H. J. White and S. T. Litchfield, Jr., *Bull. Johns Hopkins Hosp.,* 67: 163, 1940.

[3] D. D. Woods, *Brit. Jour. Exp. Path.,* 21: 74, 1940.

action of sulfanilamide, its effect on rats fed diets containing sulfaguanidine was explored. The action of yeast was also tested. At the time of the completion of this work, Black *et al.*[4] reported that liver extract, and to a lesser degree p-amino benzoic acid, prevented the growth-inhibiting effect of sulfaguanidine in rats fed a purified ration. Our results on growth are in general agreement with theirs.

We wish to report the extensive alterations observed in the thyroids of rats fed sulfaguanidine[5] in a diet containing synthetic B vitamins[6] and p-amino benzoic acid, or in a diet containing yeast.

The basal ration was composed of purified casein 200, sucrose 600, lard 40, salts 60, 2-methyl-1.4-naphthoquinone 0.005, and 13 drops of haliver oil fortified with viosterol. To this mixture was added either 100 parts of dried yeast, or 5 mg each of thiamin, riboflavin and pyridoxin, 15 mg of calcium pantothenate, 250 mg of choline, and 500 mg of cystine, with or without 2.5 gm of p-amino benzoic acid. When added, sulfaguanidine was incorporated at a 1 or 2 per cent. level. The distilled drinking water contained 20 mg of iodine and 40 mg of potassium iodide per liter one day a week.

Rats from our stock colony were placed on these diets at 21 to 23 days of age. Animals receiving sulfaguanidine were sacrificed at periods varying from 6 to 16 weeks. Without exception their thyroids were hypertrophied and hyperemic. The glands were 3 to 8 times larger than those of the control animals receiving the same diets without sulfaguanidine. Rats on the diets containing synthetic B vitamins (without p-amino benzoic acid) plus sulfaguanidine developed bleeding from the anterior corner of the eye, which later involved the whole eye. This symptom was prevented by p-amino-benzoic acid in rats receiving 1 per cent. of sulfaguanidine, but not in those receiving 2 per cent. It was always prevented by yeast.

A second experiment was conducted in which rats on the yeast diet plus 1 or 2 per cent. of sulfaguanidine were killed at the end of 4 weeks and their thyroids removed for sectioning. The glands were hyperemic and 3 to 4 times larger than those of the control animals on the yeast diet without sulfaguanidine. Histologically, the thyroids of the 2 per cent. sulfaguanidine rats showed marked hyperplasia. The epithelium was distinctly columnar, and in most follicles so increased and invaginated as to nearly extinguish the lumen. But few of the lumina contained colloid, and where present it was vacuolated and shredded. The connective tissue was not appreciably increased, but the glands were very vascular. In the rats receiving 1 per cent. sulfaguanidine, the thyroids contained a little more colloid; and the columnar epithelium was not so invaginated, otherwise the picture was the same. The thyroids of the control rats were normal. They contained an abundance of colloid and the epithelium was of the cuboidal type. Histological examination of the kidneys of these sulfaguanidine animals revealed no abnormalities. The bladders and ureters contained no visible calculi. The growth of the rats on both levels of the drug equaled that of the controls during the 4-week experimental period, and no gross symptoms were observed. (After the fourth week there is a retardation in the rate of growth.) It is of interest to note that Richter and Campbell[7] have very recently reported similar thyroid changes in rats fed phenylthiocarbamide.

At present we are investigating the effect of increasing the iodine intake at the beginning of the experiment and after the thyroid has hypertrophied. We are also testing the action of other "sulfa" drugs, sulfanilic acid, guanidine and thiourea on the thyroid in several species. The results of these studies together with a detailed account of the above observations will be published elsewhere in the near future.

JULIA B. MACKENZIE
C. G. MACKENZIE
E. V. MCCOLLUM
SCHOOL OF HYGIENE AND PUBLIC HEALTH,
THE JOHNS HOPKINS UNIVERSITY

[4] S. Black, J. M. McKibbin and C. A. Elvehjem, *Proc. Soc. Exp. Biol. and Med.*, 47: 308, 1941.

[5] We are indebted to Lederle Laboratories, Inc., for the sulfaguanidine used in this experiment.

[6] We are indebted to Merck and Company, Inc., for supplies of the synthetic vitamins.

EFFECT OF ULTRAVIOLET LIGHT ON POLYCYCLIC HYDROCARBONS IN STEROL SURFACE FILM SYSTEMS

IN the course of a detailed study of the interaction of carcinogenic and other polycyclic hydrocarbons with sterols and other cellular constituents in mixed films at the air-water interface,[1] the conditions under which such hydrocarbons undergo ultraviolet decomposition have been investigated. Since these experiments may have some bearing on (*a*) the mechanism of detoxification and disposal of hydrocarbons subject to carcinogenic experiments,[2] and (*b*) the intense photodynamic effects exhibited by polycyclic hydrocarbons on bacteria[3] and other cells,[4] a preliminary statement of the results is presented here.

In such mixed films with sterols, certain polycyclic

[7] C. P. Richter and K. H. Campbell, *Arch. Path.* (in press).

[1] W. W. Davis, M. E. Krahl and G. H. A. Clowes, *Jour. Am. Chem. Soc.*, 62: 3080, 1940.

[2] L. Velluz, *Compt. rend. Acad. Sci.*, 206: 1514, 1938.

[3] A. Hollaender, P. A. Cole and F. S. Brackett, *Am. Jour. Cancer*, 37: 265, 1939.

[4] I. Doniach and J. C. Mottram, *Nature*, 145: 748, 1940.

hydrocarbons can be held in two-dimensional solution or in two-dimensional molecular association with the sterols.[1] By application of pressure to the mixed films, the hydrocarbon molecules can be displaced from their area-determining positions in the film, passing into an excess phase outside of the film, but in close proximity to it. The formation of the excess phase is characterized by the appearance of light-scattering particles which display Brownian movement; when the pressure is released, those hydrocarbons which are capable of solution type interaction with sterols can rapidly re-enter the films with the complete disappearance of the excess phase.

The present experiments show that, when in this excess phase, certain hydrocarbons are extremely sensitive to ultraviolet photodecomposition; on the other hand, when held between sterol molecules in the area-determining film phase, the same hydrocarbons are not subject to photodecomposition at the intensity of ultraviolet light employed.

A 15-watt G. E. germicidal lamp, supplied with an aluminum reflector, was mounted over the previously described[1] film tray at a vertical distance of 8 inches from the surface. The predominant radiation was at 2,537 A., but the principal mercury emission lines up to 4,338 A. were also prominent. The mixed films were put under pressures which gave the desired proportion of the hydrocarbon in the excess phase, irradiated for 15 minutes, and the force-area characteristics of the resulting film were then studied.

Typical results with 10-amyl-1,2-benzanthracene in mixed films with cholestanol may be cited as a convenient example. This hydrocarbon, when in the excess phase, was converted by irradiation into a surface active substance which was adsorbed, in addition to the sterol, at the water surface; this surface active substance could be detected and characterized by its surface film behavior. The conversion of the hydrocarbon was partially blocked by inclusion of a reducing agent, such as pyrogallol, in the water upon which the mixed film was originally spread; this indicated that the excess phase was in the water beneath the film and that the photodecomposition of the hydrocarbon took place there. This point of view was supported by two other observations: (1) when an aqueous suspension of 10-amyl-1,2-benzanthracene was introduced into the water phase immediately under a sterol film, the hydrocarbon molecules entered the film in much the same manner as hydrocarbons enter the film from the excess phase; (2) when an aqueous suspension of 10-amyl-1,2-benzanthracene was irradiated in bulk in the presence of dissolved oxygen, the substance formed had exactly the same surface properties as the material produced by irradiation of the 10-amyl-1,2-benzanthracene in the excess phase of the mixed films.

Similar experiments were performed with a number of other polycyclic hydrocarbons, including 9,10-dimethyl-1,2-benzanthracene, numerous mono-alkyl-1,2-benzanthracenes, and several mono- and di-alkyl-chrysenes. In each case where photodecomposition occurred in the film experiments, irradiation of the same hydrocarbon in bulk suspension caused loss of its characteristic ultraviolet absorption at wavelengths greater than 2500 A.

The photodecomposition product isolated after irradiation of the bulk aqueous suspension of 9,10-dimethyl-1,2-benzanthracene corresponded, in its analysis for C and H and in its lack of the characteristic absorption spectra of 1,2-benzanthracene derivatives, to the photo-oxide produced from 9,10-dimethyl-1,2-benzanthracene in CS_2 solution according to the method of Cook and Martin.[5] The relative ease of photodecomposition of the hydrocarbons in the excess phase and in bulk aqueous suspension was found to be the same as the relative photooxidizability in CS_2 as observed by Cook and Martin.

In contrast to the parent hydrocarbons, the photo-oxidation products of 10-amyl-1,2-benzanthracene and other alkyl-1,2-benzanthracenes were found to exhibit no interaction with sterols in surface films. The photo-oxides which were prepared from carcinogenic hydrocarbons by Cook and Martin[5] were found by them to be non-carcinogenic.

SUMMARY

Certain alkyl-1,2-benzanthracenes and other polycyclic hydrocarbons, when irradiated either in bulk aqueous suspensions or in the comparable excess phase under mixed surface films, were converted rapidly by ultraviolet light to photo-oxides. When held in two-dimensional solution or molecular association with sterols in mixed surface films at the air-water interface, the hydrocarbons were protected from such photodecomposition. In the one case where the comparison could be made photo-oxidation was accompanied by a loss of the ability of the hydrocarbon to interact with sterol films.

W. W. DAVIS
M. E. KRAHL
G. H. A. CLOWES

LILLY RESEARCH LABORATORIES

A PHYTOPATHOGENIC BACTERIUM FATAL TO LABORATORY ANIMALS

Phytomonas polycolor (Clara) Bergey *et al.*, the causal agent of a bacterial leafspot disease of tobacco, was first isolated and described by Clara[1] in the

[5] J. W. Cook and R. H. Martin, *Jour. Chem. Soc.*, 1940, 1125.

[1] F. M. Clara, *Phytopath.*, 20: 691, 1930.

Philippines. The damage resulting from the disease to both seedling and field plants caused great concern in several tobacco-growing areas. Spraying and needle puncture inoculations recently conducted in this laboratory have shown the culture to be pathogenic for tobacco. On the basis of its disease-producing ability in plants, this organism has been placed by systematists among the phytopathogenic bacteria.

In the course of a serological study of the green fluorescent group of phytopathogenic bacteria, to which *Phytomonas polycolor* has been ascribed, it was found that this organism was extremely virulent when introduced into small laboratory animals. Rabbits, guinea pigs and mice were found to be susceptible. Intraperitoneal injections of 0.05 cc of a 24-hour broth culture proved fatal to mice in 12 hours, while 0.25 cc killed 300 g guinea pigs in the same period of time. The intravenous injection of 0.2 cc of a bacillary suspension brought about the death of 2,000 g rabbits in 24 hours. Bacterial cells which had been washed free of metabolites were found to be as lethal as were the broth cultures. In each case the organism was recovered in pure culture from the heart's blood, spleen, liver and lung. Intravenous injections into mice of 0.2 cc of the sterile filtrate of a broth culture failed to kill, whereas the same culture unfiltered was fatal. Varying amounts of washed bacterial cells which had been killed by heating at 55° C for 1 hour failed in each instance to kill mice. Sterile filtrates of lysed suspensions of the organism (lysed by alternate freezing and thawing) were apparently toxic for mice on intraperitoneal and intravenous injection but failed to cause the death of the animals. It was possible to isolate the organism from the blood stream in moderate quantities 5 or 6 hours before death, and in great numbers just previous to death. There seems no doubt, therefore, that this organism multiplies within the animal and manifests itself in a true bacteraemic fashion. That the organism is not particularly invasive is evident from the fact that very small doses were not fatal. Forced feeding of the organism produced no ill effects. Fifteen other organisms of the green fluorescent group of plant pathogens failed to produce any of the results noted above.

Although a comparative study has not yet been completed, all available evidence points to the probability of this organism being *Pseudomonas aeruginosa* (Schroeter) Migula. Whatever its true identity, the ability to multiply in both animal and plant tissues is remarkable. The fact that both animals and plants are susceptible to experimental infection makes this organism interesting from an evolutionary point of view.

R. P. ELROD
ARMIN C. BRAUN
DEPARTMENT OF ANIMAL AND PLANT PATHOLOGY,
THE ROCKEFELLER INSTITUTE FOR
MEDICAL RESEARCH,
PRINCETON, N. J.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SCALE FOR GRAPHICALLY DETERMINING THE SLOPES OF DOSE–RESPONSE CURVES

THE following device, which may have been overlooked by other workers in the field of biological assay, has been found useful in our laboratories for the routine estimation of the slopes of such dose-response curves as may be transformed into straight lines. It is based on the well-known fact that the slope is a tangent. As Fig. 1 shows

$$b = \frac{y_2 - y_1}{x_2 - x_1} = R \tan \theta \text{ or } \tan \theta = b/R.$$

In these equations b is the slope, x_2, y_2 and x_1, y_1 are the coordinates of any two points on the line, θ is the indicated angle and R is the ratio of the length of one plotted unit of dose to the length of one plotted unit of response. The dose-response curve must be plotted in such a way as to give a straight line. This usually can be done for the graded response type of data by plotting response against the log dose. And the curve for the all-or-none type of data may be made straight by converting the response into probits by means of

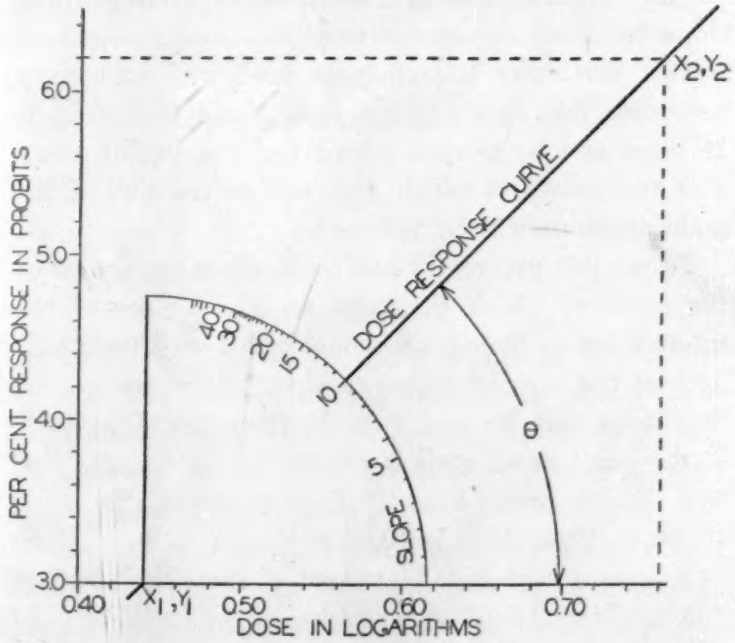

FIG. 1

tables developed by Bliss[1] and then plotting the probits against the log dose.

[1] C. I. Bliss, *Quart. Jour. Pharm. and Pharmacol.*, 11: 192, 1938.

As a practical example, in the graphic calculation of the results of routine biological assays of the all-or-none type it was found convenient to plot all such results on a graph in which each x or log dose unit was 50 cm long and each y or probit unit was 5 cm long. Therefore, $R = 50/5 = 10$. For making the scale a simple table like that below was constructed. In the

TABLE I

Slope or b	Slope/R or tan θ	θ in degrees
1	0.1	5.72
2	0.2	11.32
3	0.3	16.70
.	.	.
.	.	.
.	.	.
60	6.0	80.53

first column a series of consecutive slope figures, such as one may expect to encounter, was written down. The second column, giving the values of the tan θ was calculated by substituting the corresponding slope figures in the equation $\tan \theta = b/10$. The values of θ were then obtained from a table of tangents, and for convenience the minutes were converted into decimal fractions of degrees by dividing by 60. To mark off the actual divisions on the scale, select a point as the angle zero on a piece of polar coordinate paper which is divided into 360 degrees, and mark off each slope value at the proper number of degrees from zero, using the relationship between the slope values and the corresponding angles as given in the first and last columns of the table. For example, at a distance of 16.7° from zero make a mark corresponding to the slope 3.

This particular scale may be used with any assay providing that on the graph, each x unit (log dose) is 10 times as long as each y unit (cc, gm, probit, etc.). For any graph in which R is not 10 the size of the scale divisions will be different.

To use this protractor-like scale, place the center of the circle of which the slope scale is an arc at the intersection of the dose-response curve with the x axis and let the zero of the scale also fall on the x axis. The slope may be read directly from the slope scale at the point at which it is intersected by the straight-line dose-response curve. In the figure, the scale shows that the slope is 10.

A complete graphic treatment of the Bliss[1] method for handling the all-or-none type of data will be published in the near future.

EDWIN J. DEBEER

THE EXPERIMENTAL RESEARCH LABORATORIES,
BURROUGHS WELLCOME & CO., U. S. A.,
TUCKAHOE, N. Y.

MODIFIED HYDRAULIC METHOD FOR REMOVING PLUNGERS FROM "FROZEN" SYRINGES

A METHOD similar to the one described recently by McCoord in SCIENCE, volume 94, page 170, has been used by us for several years to remove the plungers of "frozen" syringes. An additional simple device which we use makes the method more convenient and foolproof. We realize that this modification may already be familiar to some, but feel that since the problem is such a common one in clinical laboratories, any additional improvement is worthy of publicity.

The drawing (Fig. 1) illustrates the method. The

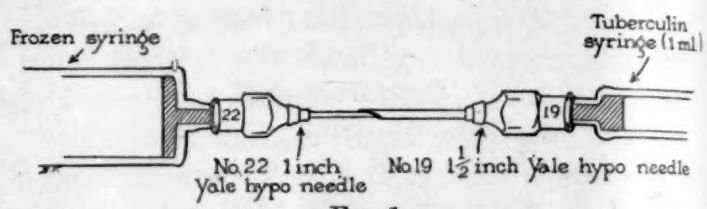

FIG. 1.

device referred to consists of a number 22 (one inch) Yale hypodermic needle telescoped into a number 19 (one and one-half inch) Yale hypodermic needle so as to make a tight connection. Other tight-fitting combinations of needles may be used and, if desired, the connection may be soldered, although we have not found this necessary. By attaching one end of the device to the "frozen" syringe and the other to a tuberculin syringe filled with water, enough hydraulic pressure can be developed by exerting force on the plunger of the tuberculin syringe to free the barrel. The desired result is almost always attained. The device can be made in a few minutes and can be kept on hand for future use which, in our experience, is frequent.

MILAN NOVAK

COLLEGES OF MEDICINE,
DENTISTRY AND PHARMACY,
UNIVERSITY OF ILLINOIS

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